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BOARD ON
PHYSICS AND ASTRONOMY

December 29, 1994

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

DOCKET FILE COPY ORIGINAL

Re: ET Docket No. 92-166

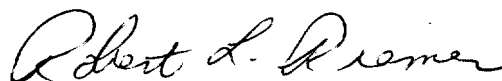
In the Matter of
Amendment of the Commission's Rules to
Establish Rules and Policies Pertaining
to a Mobile Satellite Service in the
1610-1626.5/2483.5-2500 MHz Frequency
Bands

Dear Ms. Searcy:

Transmitted herewith by the Committee on Radio Frequencies, operated by the National Research Council for the National Academy of Sciences, are an original and nine (9) copies of its Opposition to the Petitions for Reconsideration filed by TRW, Inc., and Constellation Communications, Inc., in the above-referenced proceedings. CORF respectfully requests that the Commission accept the attached late-filed Comments for the reasons indicated in its Opposition.

If additional information is required concerning this matter, please communicate with this office.

Sincerely yours,



Robert L. Riemer
Senior Program Officer

Enclosure

cc: Members of CORF
Mr. Paul J. Feldman
Mr. Richard Gould

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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In the Matter of)
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Bands)

**MOTION FOR LEAVE TO FILE
AND
OPPOSITION TO PETITIONS FOR RECONSIDERATION**

The National Academy of Sciences, through the National Research Council's Committee on Radio Frequencies (hereinafter, "CORF"), hereby opposes the Petitions for Reconsideration of the Commission's Mobile Satellite Service Report and Order¹ filed by Constellation Communications, Inc. ("Constellation") and TRW Inc. ("TRW") on November 21, 1994.² The Constellation Petition

¹FCC 94-261, released October 14, 1994 (hereinafter, the "MSS R&O").

²Oppositions to Petitions for Reconsideration were due to be filed on December 20, 1994. Accordingly, CORF hereby moves for leave to file this Opposition. Because of the press of other business connected with this volunteer committee, the members of CORF were unable to complete their review of this Opposition prior to the filing deadline. Good cause exists for accepting this Opposition because it contains factual and policy responses to issues raised in the Petitions which impact on the Radio Astronomy Service, and thus on the public interest. Indeed, this Opposition is likely to be the only pleading responding to the issues discussed herein from the perspective of radio

contains proposals for modifications of the Commission's MSS rules which could result in substantial destructive interference to radio astronomy operations, while the TRW Petition seeks clarification of speculative possibilities that should not occur if MSS operators make a reasonable demonstration of the viability of beacon-actuated protection systems.

I. Introduction

The presence of CORF in this proceeding results from the fact that the radio astronomy operations at 1610.6-1613.8 MHz are protected on a co-primary basis both internationally and in the U.S. Table of Allocations. As the Commission has recognized, while the radio astronomy service ("RAS") has produced unique and important information about our universe, it is also uniquely vulnerable to interference from both in-band and out-of-band emissions since the signals received from the cosmos are extraordinarily weak--usually less than a trillionth of a watt.

astronomers, the parties whose interests are most affected by these issues. In order to limit any prejudice to the rights of Constellation and TRW, copies of this Opposition have been faxed to Counsel for those parties, and CORF would support an extension of time for those parties to reply to this Opposition. Such a brief extension would not substantially delay this proceeding. If the Commission decides that it cannot accept late-filed Oppositions in this proceeding, CORF asks that this pleading then be considered as an Informal Objection.

Accordingly, the Commission has recognized the special need to protect this passive service,³ and the MSS rules regarding interservice sharing with RAS reflect the importance of protecting the RAS. These rules constitute finely balanced compromises negotiated at length between representatives of the RAS and proposed MSS operators. Unfortunately, Constellation and TRW now seek modifications of those rules that could substantially harm RAS operations. These proposals have previously been made by Constellation and TRW and have been considered and rejected by the Negotiated Rulemaking Committee in this proceeding and/or by the Commission in the MSS R&O. Neither party has provided a new and compelling basis for reconsideration of these proposals, and the Commission should reject them. Similarly, TRW also seeks clarification that radio astronomers and MSS operators are required to cooperate in the coordination of beacon actuation systems and that in the case of disputes, the Commission will be the final arbiter. Such clarifications are largely self-evident since the Commission is of course the final arbiter of compliance with its rules and should be unnecessary if the MSS operator makes a valid demonstration of the viability, efficiency, and reliability of a beacon system.

³See, MSS R&O at para. 100.

II. Constellation Proposals

A. Section 25.213 (a)(1)'s Position Determination Requirements Must Continue to be Applied to Out-of-Band Transceivers.

Section 25.213(a)(1) of the Commission's rules requires that all 1.6/2.4 MHz MSS systems be capable of determining the position of user transceivers so that such equipment is not operated when located within certain specific (and limited) geographic zones surrounding RAS facilities. The Commission recognized that this requirement is critical to protection of RAS facilities, at least until other alternatives (such as a beacon-actuated protection system) are demonstrably effective. See MSS R&O at para. 104.

In its Petition (at pages 12-13), Constellation seeks a modification of this rule that would impose this position determination requirement only on transceivers that access their MSS system in the 1610.6-1613.8 GHz band. This proposal is apparently based on a misunderstanding of, or an attempt to ignore, the substantial and damaging impact of out-of-band and spurious emissions on RAS operations. Such unwanted emissions⁴ from transceivers operating near a radio astronomy installation

⁴Note that the terms "out-of-band," "spurious," and "unwanted emissions" used here follow the definition in RR article 1, numbers 138-140.

on a frequency close to the edge of the RAS band (e.g., at 1613.9 MHz) could easily cause greater interference to RAS operations than in-band MSS operations at a distance of 100 or 160 kilometers. Such interference is thus as unacceptable as in-band interference.

CORF recognizes the value of minimizing the cost of transceiver equipment as described by Constellation. Nevertheless, CORF believes that radio determination to the required precision using other techniques can be performed at minimal cost. If such an approach is still unacceptable to Constellation, then it must recognize that the RAS was receiving some protection at these frequencies long before spectrum was allocated to MSS and for good reason: the 1610.6-1613.8 MHz band is critical to radio astronomy, and thus to the public interest. Protection of these RAS operations in the 1610.6-1613.8 MHz band from unwanted emissions from the MSS in the full 1610-1626.5 MHz band was clearly contemplated in the allocation of spectrum to MSS⁵ and must be accepted as a cost of doing business by operators moving into the fledgling MSS field.

In sum, the position determination requirements of Section 25.213(a)(1) must continue to be applied to all transceivers

⁵See page 6, *infra*.

operating in the 1610-1626.5 MHz band.⁶ The Commission has already considered and rejected Constellation's proposal,⁷ and Constellation has provided no compelling basis for reconsideration.

B. Section 25.213(a)(1)(iii) is Necessary for the Protection of RAS, and is
Consistent with International Regulations.

Section 25.213(a)(1)(iii) of the rules requires that out-of-band emissions of mobile earth stations ("MES") must be attenuated so as to protect specified radio astronomy sites. The rule also provides that as an alternative, MES must not operate in the 1613.8-1615.8 MHz band within specified distances of certain protected sites during radio astronomy observations. The rule notes further that there are no restrictions on MES operations within the 1615.8-1626.5 MHz band. As was noted above and recognized by the Commission, RAS is uniquely vulnerable to interference from out-of-band emissions, and this rule section provides narrowly drawn protections from out-of-band emissions while giving MSS operators two alternatives for operations

⁶This requirement could be exempted for MSS operators who have a coordination agreement with the Electromagnetic Spectrum Management Unit for the operation of a beacon actuation protection system.

⁷See MSS R&O at para. 102.

closest to the protected RAS band and a third alternative with no such restrictions for operations at more distant frequencies.

Notwithstanding the limited impact on MSS operations resulting from having three alternatives,⁸ Constellation urges the Commission to eliminate or provide a "detailed technical justification" for Section 25.213(a)(1)(iii). Constellation asserts that because this rule appears to provide RAS the same level of protection from out-of-band emission as from co-channel interference, it is inconsistent with international regulations, specifically, ITU RR 344. Petition at page 14. This position fails to recognize the unique relationship between the RAS and the MSS allocations, which is expressed in ITU RR 733E.

While ITU RR 344 states that RAS should only receive the same level of protection as that which is afforded to other stations in a particular service, this rule is a general principle. It must be recognized that the relationship between RAS and MSS in this band is a unique one: the RAS allocation is a sub-band of the broader and surrounding MSS band. Essentially, the RAS and

⁸At note 28 of its Petition, Constellation clearly misunderstands the interference potential of MES's to the RAS. There are likely to be many MES's within the 1% of the U.S. constituting the protection zones around radio astronomy observatories. Even one such terminal operating in the MSS band above 1613.8 MHz could cause harmful interference for a very large fraction of the time that observations are being made.

the MSS share the same band and for practical purposes, while they are co-primary users on the 1610.6-1613.8 MHz portion of the band, the RAS must be protected from unwanted emissions of the MSS operating in the full 1610-1626.5 MHz band. The ITU recognized this unique relationship at WARC-92 through the enactment of RR 733E.⁹

In sum, Section 25.213(a)(1)(iii) is necessary to protect RAS facilities which are particularly vulnerable to unwanted emissions from MSS operations in surrounding bands. Such protection is necessary given the unique relationship between the RAS and MSS allocations. Furthermore, the protection afforded by this Section is consistent with international regulations.

III. TRW Proposals

A. The Reference Bandwidth for Interfering Signals Must Not be Expanded to One Megahertz.

TRW proposes, at pages 11-12 of its Petition, a third alternative to the two existing protections of RAS from out-of-band emissions. Under this proposal, MES's transmitting in the 1613.8-1626.5 MHz band may limit out of band emissions so as not

⁹RR 733E states that "harmful interference shall not be caused to stations of the radioastronomy service using the band 1610-1613.8 MHz by stations of the radiodetermination satellite service."

to exceed $-178 \text{ dB(W/m}^2\text{/1 MHz)}$ during observations at certain RAS sites and $-138 \text{ dB(W/m}^2\text{/1 MHz)}$ during observations at other RAS sites. TRW claims that such a proposal would "fully protect RAS sites" and would be of "far greater use to the RAS community." These assertions are not true.

This proposal for the reference bandwidth of interfering signals to be 1 MHz rather than one Hertz could result in substantial harm to RAS operations. Typical spectrometer channel bandwidths can be as narrow as a fraction of a kilohertz. If the power in an interfering signal were concentrated in a bandwidth narrower than 1 MHz, and in which an observation was being made, the interference would be harmful, even though the power averaged over the much wider 1 MHz reference bandwidth proposed by TRW would be below the limit. TRW's proposal has already been considered and rejected by the Commission, and for good reason. It has presented no basis for reconsideration of this harmful proposal, and the Commission should deny that portion of its Petition.

B. Coordination of Beacon Actuation Proposals is
Necessary to Protect RAS and Consistent With
the Co-Primary Status of RAS and MSS.

As noted in the MSS R&O, while the Negotiated Rulemaking Committee recognized the potential value of beacon-actuated

protections systems as an alternative to fixed protection zones, the Committee concluded that several theoretical and practical concerns must be addressed before such a system can be implemented. To date no applicant, including Motorola who first suggested a beacon-actuated protection system, has made any practical demonstration that such a system actually works, or even described the design of such a system in any filing made to the Commission or submitted to the MSS Above 1 GHz Negotiated Rulemaking Committee during the course of its deliberations.

Based on the evidence regarding the state of beacon actuation proposals, the Commission took a moderate approach (in Section 25.213(a)(1)(vii)), requiring compliance with fixed radius protection zones, but allowing the alternative use of beacon actuation protection if a coordination agreement is reached between the MSS operator and the Electromagnetic Spectrum Management Unit ("ESMU") of the National Science Foundation. In essence, all that the coordination requires of MSS operators is a valid demonstration that an actual beacon actuation system works, and an agreement to use such a system in a manner that sufficiently protects RAS facilities from harmful interference.

In its Petition (at paras. 9-10), TRW pledges to undertake such coordination in good faith, but fears that the requirement

gives the ESMU "effective veto-power" over the use of beacon systems in a manner allegedly inconsistent with the co-primary status of RAS and MSS, and the recognition by the Commission that efficient alternatives to the fixed exclusion zones may be developed. Accordingly, TRW seeks clarification that (1) the RAS community is required to cooperate with the MSS community in the installation of beacon transmitters, (2) that the Commission is the final arbiter of any disputes over coordination, and (3) that if an MSS operator reaches a coordination agreement to use a beacon system, or otherwise obtains Commission authority to do so, that it need not offer position determination capability as well.

It should be noted first that the coordination requirement is not inconsistent with the co-primary status of RAS and MSS. In fact, the requirement for agreement between two parties is a defining trait of a co-primary status relationship.

CORF believes that the first item for which TRW seeks clarification is unnecessary: CORF has always cooperated with the MSS community and will continue to do so. In general, cooperation is obviously in CORF's best interest, and CORF will continue to cooperate in connection with coordination with beacon-actuated systems. However, CORF merely seeks demonstrable

assurances that a beacon-actuated system will work, and that its operator will use the system appropriately.

The second item is equally unnecessary: the Commission is of course the final arbiter in any matter affecting the licensing and operation of MSS systems in the U.S., just as it is the final arbiter in any dispute over compliance with regulations in other services under its jurisdiction. However, CORF is concerned that there has been no demonstration of the viability, efficiency and reliability of beacon systems and that an MSS operator may seek to use the existing power of any licensee to seek a waiver of the rules from the Commission to avoid making such a demonstration. CORF trusts that upon review of any such waiver requests, the Commission will be as protective as radio astronomers of RAS operations in the 1610.6-1613.8 MHz band.

Regarding the third item for which clarification is sought, CORF believes that if an MSS operator makes a demonstration of the successful operation of a beacon-actuated system that operates at or below the harmful interference levels contained in ITU-R RS.769, then position determination would no longer be necessary for the operator of that system.

IV. Conclusion

The portion of the spectrum used by radio astronomers is a unique resource that has produced and, with continued protection, will continue to produce remarkable cosmic discoveries and important information about our universe. Radio astronomy also produces tangible technological benefits used in a variety of radio communications services. Radio astronomers' use of this small fraction of the spectrum is uniquely susceptible to interference, and thus it must continue to be carefully guarded. CORF believes that the interservice sharing rules discussed herein reflect the unique relationship between the RAS and MSS allocations and also reflect an appropriate balance of the needs of both the RAS and MSS communities. The Commission should therefore deny the Constellation and TRW Petitions as discussed above and approach the TRW requests for clarification with the intention of retaining the finely crafted balance expressed in the MSS R&O and the Part 25 rules.

Respectfully submitted,
NATIONAL RESEARCH COUNCIL'S
COMMITTEE ON RADIO FREQUENCIES

By:



Bruce Alberts
Chairman

December 29, 1994

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CERTIFICATE OF SERVICE

I, Robert L. Riemer, hereby certify that the foregoing "MOTION FOR LEAVE TO FILE AND OPPOSITION TO PETITIONS FOR RECONSIDERATION" was served by hand delivery, fax, or mail, as indicated below, on this 29th day of December, 1994, on the following:

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